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ABSTRACT

A computer program written for the Apple II was designed to teach college students how to map expository information. The program consists of five lessons, the first beginning with a definition and illustration of mapping. In this introductory lesson, students are asked to answer three basic questions when reading expository text: identify the subject/topic of the discourse; identify the subcategories/ideas of the discourse; and identify the details of the discourse. Lesson two focuses on the selection of the topic. Paragraph-length text is presented and followed by a multiple choice question directing the student to select the topic. After the topic is selected, a map representing the ideas in the paragraph is shown. Lesson three focuses on selecting the topic and subcategories. Again, a paragraph-length text is presented and followed by a question directing the student to select the topic. Next, the student selects the subcategory. The fourth lesson focuses on selecting the topic, the subcategories, and the details. The procedure for questions and answers is the same as in lesson three. Lesson five presents information concerning creative aspects of mapping. In the program the same color is used to depict certain levels of information, such as orange for topic or green for subcategory. In addition, pictures are used to illustrate the use of mnemonic aids to enhance the recall of information. (HOD)

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Comprehension: Mapping Information, a Program for the Apple Computer

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the National Association for Developmental Education.

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Cognitive mapping of expository information is a useful study strategy students can employ to comprehend and retain information (Hanf, 1971; Armbruster & Anderson, 1980; Anderson & Armbruster, 1980; Solon, 1980; Driskell; 1977; Geva, 1983). Therefore, a program designed to teach students how to map expository information was written for the Apple II.

Definition

When mapping text, a student displays the meaning of the text via a diagram showing the interconnectedness of the ideas in the text. Three main levels of information are depicted: (1) the subject/topic, (2) the subcategories/ideas, and (3) the details.

Review of the Literature

Armbruster and Anderson (1980) presented four areas of research which indicate that mapping is an effective study strategy. The areas include research on adjunct questioning, text structure, background knowledge, and the use of diagrams. A further review of the literature reveals additional research supporting the areas discussed by Armbruster and Anderson. Andre and Anderson (1978-79) investigated whether having high school students generate their own questions would facilitate their comprehension. In the first experiment one group was trained in a technique for constructing their own questions on the text. Although results showed no significant differences between the question trained group and the control group, the types of questions generated had an effect on the post test performance. That is, good text-based questions resulted in a higher probability of answering questions correctly on the post test. Results from the second experiment showed that a question trained group and a question untrained group did significantly better than the

control group. The researchers hypothesized that a possible reason for the question generating groups scoring higher is that generating questions forced the subjects to process the text at a deeper semantic level.

Research reveals that awareness and use of text structure in organizing recall of ideas appears to enhance the number of ideas recalled. Taylor (1980) investigated subjects' ability to recall text and their sensitivity to text structure. Results revealed that adults organized their recall according to top level text structure for both immediate and delayed recall. There was no difference between the sixth grade good and poor readers and fourth grade good readers in the use of top level structure for immediate recall. However, there was a difference for delayed recall, specifically, more sixth grade good readers used the top level structure than sixth grade poor readers and fourth grade good readers. Further tests indicated that sixth graders who used the top level structure recalled more ideas on the two-day delayed recall test.

Armbruster and Anderson (1980) proposed that background knowledge is extremely important. A schema theory view of reading contends that prior knowledge which includes knowledge a person has about concepts, events, and sequences of events facilitates comprehension. The prior knowledge may serve as an anchoring post for incoming information, thus increasing the probability that a message will be understood. Subjects in experimental groups in some studies were provided with contextual cues such as pictures, or thematic titles to passages (Bransford & Johnson, 1972; Schallert, 1976; Dooling & Mullett, 1973; Sulin & Dooling, 1974; Dooling & Christiaansen, 1977). The purpose of this procedure was to induce subjects to instantiate an appropriate schema to which the incoming

information could be anchored or assimilated. Results of these studies support the contention that a reader's prior knowledge has a facilitating effect on comprehension and recall.

Studies focusing on the effectiveness of mapping indicate that mapping enhances comprehension and recall. Armbruster and Anderson (1980) directly investigated the effectiveness of mapping on reading comprehension of eighth grade students. Eleven students received approximately twelve hours of instruction in mapping expository prose. Results revealed that students in the mapping group recalled significantly more information after 24 hours than students in the control group who used their own method of reading. The results approached significance on the immediate recall of the second passage. In addition, it was found that the probability of recall was higher for mapped than unmapped information. Rauch and Fillenworth (1980) compared mapping with two other study strategies, reading and student self-selected strategy. Sixteen college students enrolled in a Reading and Study Skills course were randomly assigned to one of three groups. Six students were taught to map information. Results from an analysis of covariance, using the total score from a standardized reading test as the covariate, showed no significant differences between groups on the delayed retention of information for each of three question types: main idea, subcategories, and details. However, although students in the mapping group had the lowest mean on the standardized reading test, this group achieved the highest mean on each question type. This was an interesting result in light of the fact that the mapping group received only two fifty minute instructional sessions with the mapping strategy whereas students in the self-selected strategy were allowed to use their preferred strategy, one developed over a long period

of time. Geva (1983) investigated the effects of training community college students to flowchart on measures of comprehension. The training procedures focused on increasing students' awareness of text structure. Instruction was scheduled for four weeks with four one-hour sessions per week. Students were taught to recognize and construct the hierarchical aspects of text (paragraphs) by a nodes-relation flowchart. Nodes are idea-units and propositions. Relations connect the nodes to each other and to the entire passage. Relations at the passage level include topic sentences and conclusions. Relations at the local level include casual-effect, examples, details, and process. Results showed that less skilled readers benefited the most from training.

In summary, research indicates that mapping is an effective study strategy for several reasons. One, the reader must be an active participant in the reading/learning process. Two, mapping requires the reader to process the information at a deeper level. Three, to map information, the reader must obtain an overall picture of the information, a framework. This framework may enhance the reader's potential to comprehend and recall the information.

Instructional Procedure

Team Approach

Writing curriculum designed to be presented on a microcomputer such as the Apple II is a difficult task, especially if the writer does not know how to program. Therefore, a team approach to writing curriculum is essential, with the basic team consisting of a classroom instructor and a computer consultant. The instructor can design and write the curriculum. The consultant can answer technical questions and supervise the coding of the program by, perhaps, student programmers.

A team approach was utilized in developing this program, "Mapping Information." The writer was a reading and study skills instructor. The Academic Computer Center provided the consultant and programmers for the project. The consultant answered technical questions, guided the writing process, and supervised the student programmers.

Lessons Contained Within The Program

There are five lessons in the computer program. Lesson one, the introduction, began with a definition of mapping and an example. The introduction included three basic questions which the student should answer when reading expository text:

1. Identify the subject/topic of the discourse
2. Identify the subcategories/ideas of the discourse
3. Identify the details of the discourse

Next, a sample paragraph was presented and mapped using different format types discussed by textbook authors (Hansen, Herling, Mayfield, Osborne, & Vance, 1975; Laughter, 1982; Wood, 1982).

A mapping aspect emphasized in the introduction was that mapping allows information to be condensed on, for example, a single page. This highly condensed information may lesson the need to reread much of the subject matter. Instead, key words may trigger associations when reviewing the material.

Lesson two focused on selection of the topic. Paragraph length text was presented followed by a multiple choice question directing the student to select the topic. After the student selected the topic, a map representing the ideas in the paragraph was shown. Specifically, the map presented the topic selected by the student, and then, the subcategories and details were added. Ten paragraph length texts were used.

Lesson three focused on selecting the topic and subcategories. Again, a paragraph length text was presented followed by a question directing the student to select the topic. Next, the student selected the subcategory or subcategories. After the correct answers were chosen, a map which included the topic and subcategories was shown. Then, the details were added. Ten paragraph length texts were also used in this lesson.

Lesson four focused on selecting the topic, the subcategories and the details. The procedure for questions and answers was the same as in lesson three. Seven paragraph length texts were used in this lesson.

Lesson five presented information concerning creative aspects of mapping. The use of color may enhance remembering information. In the program the same color was used to depict certain levels of information, orange for the topic, green for the subcategory level, blue for details, and violet for minor details. Pictures are another creative aspect students may employ. The examples showed students how unique pictures

associated with the information could be used as mnemonic aids to enhance recall of information.

Difficulties/Differences Encountered in Writing a Computer Program

Writing curriculum for the computer is similar to writing curriculum using textbooks, booklets, or single page handouts. However, there are several important differences. One, the amount of the material to be presented is restricted to the size of the screen, specifically, approximately 400 bits of information may be presented on the screen if the information is double spaced. A bit of information is defined as a letter, a number, or a sign. Since a margin around the information is visually desirable, there is a further limitation on the amount of information to be presented. A grid (see Appendix A) was used to represent the screen. This grid was extremely useful because material could be adjusted for visual balance. The grid containing information will be called a frame. Problems occurred in lesson four because several paragraph length texts covered the whole grid, or frame. The side margins did appear on the screen because the screen was larger than the grid. The text could have been presented over two frames but the writer felt it would be easier for the reader to have all the text shown on one frame. When reading a book, referring back to material is a relatively easy process. Perhaps this is because we are so familiar with books and have had extensive practice in looking back at material. In contrast, recalling text on a computer program is not an easy process for readers who are unaccustomed to working on a computer. That is, once the frame of information has passed, it may not be easy to recall it. Most programs are written so that the person can return to the text. However, not all programs have the constant look-back possibility.

At first, paragraph length text was limited to the top half of the screen so the question on selecting the topic could appear on the bottom of the screen. Then, longer text was presented and the questions were presented on the following frames. Commands were included allowing the student to refer back to the text before answering each question. Students must become accustomed to remembering information while reading for delayed recall, even if the delayed recall is only the next frame. This procedure is actually like the procedure used in some standardized reading tests.

In addition to differences encountered while writing curriculum to be presented on the Apple computer, several difficulties were also encountered. A major difficulty for the first time curriculum writer of a computer program may be the limitation of creativity. The computer consultant made numerous and valuable suggestions. Suggestions included the use of color, shapes,type size to differentiate between various levels of ideas in mapping,and dividing the program into five lessons.

This entire project was created using the "master" program, a utility program written by the Minnesota Educational Consulting Consortium (MECC). When using the master program, one is always in the graphic mode allowing one to easily mix graphics with text. Since all the text material is actually graphic characters, the options of colors, sizes, various boldness settings, and rotation are available. For example, when programming, using large bold letters is preferred for title pages and headings.

Graphics enhance a program. However, the use of graphics makes programming more difficult. For example, lines should be drawn at 45°,

vertical or horizontal, otherwise, the lines will not appear as straight lines. Pictures were used in this program and creating them presented problems. Finally, to create the pictures, the "tables" program written by MECC was used to create a shape table.

Other difficulties occurred during the actual programming. In one instance, the student programmer forgot to "save" a portion of the text, and approximately four hours of work was lost in a touch of the wrong key. After programming a portion of the text, the text should be saved and copied to another disk for a back-up system. With any project and especially with a large scale project it is important to use good back-up procedures. As portions of the project are completed and saved, these portions should be copied on a second disk for back-up purposes. In addition, a current listing should be kept to protect against an unfortunate event occurring.

Program Review

A pilot group of students will be asked to review and evaluate the program. Several questions will be considered:

1. Was the mapping concept clearly presented?
2. Was the information presented in the paragraphs (texts) interesting?
3. Was the information presented in the paragraphs (texts) similar to information found in various college textbooks or handouts?
4. Were the questions following each paragraph clearly stated?
5. Were the lessons within the program of sufficient length?
6. Which lessons did students enjoy the most? Why?
7. Which lessons did students like the least? Why?
8. What additional suggestions would improve the quality of the program?

After the student evaluations are collected, the writer and the computer consultant will discuss them and make appropriate changes in the program. It is anticipated that the evaluation process will be an on-going process for at least two quarters.

Summary

Students enjoy having a variety of materials to work with when developing and reinforcing concepts. These materials include working with books, audiotapes, videotapes, and computer programs. Teachers may experience difficulty locating specific, relevant programs. The alternative is to write programs. However, this is a difficult task especially if one does not know how to program. Therefore, a team approach to writing curriculum is essential, with the basic team consisting of a classroom instructor and a computer consultant.

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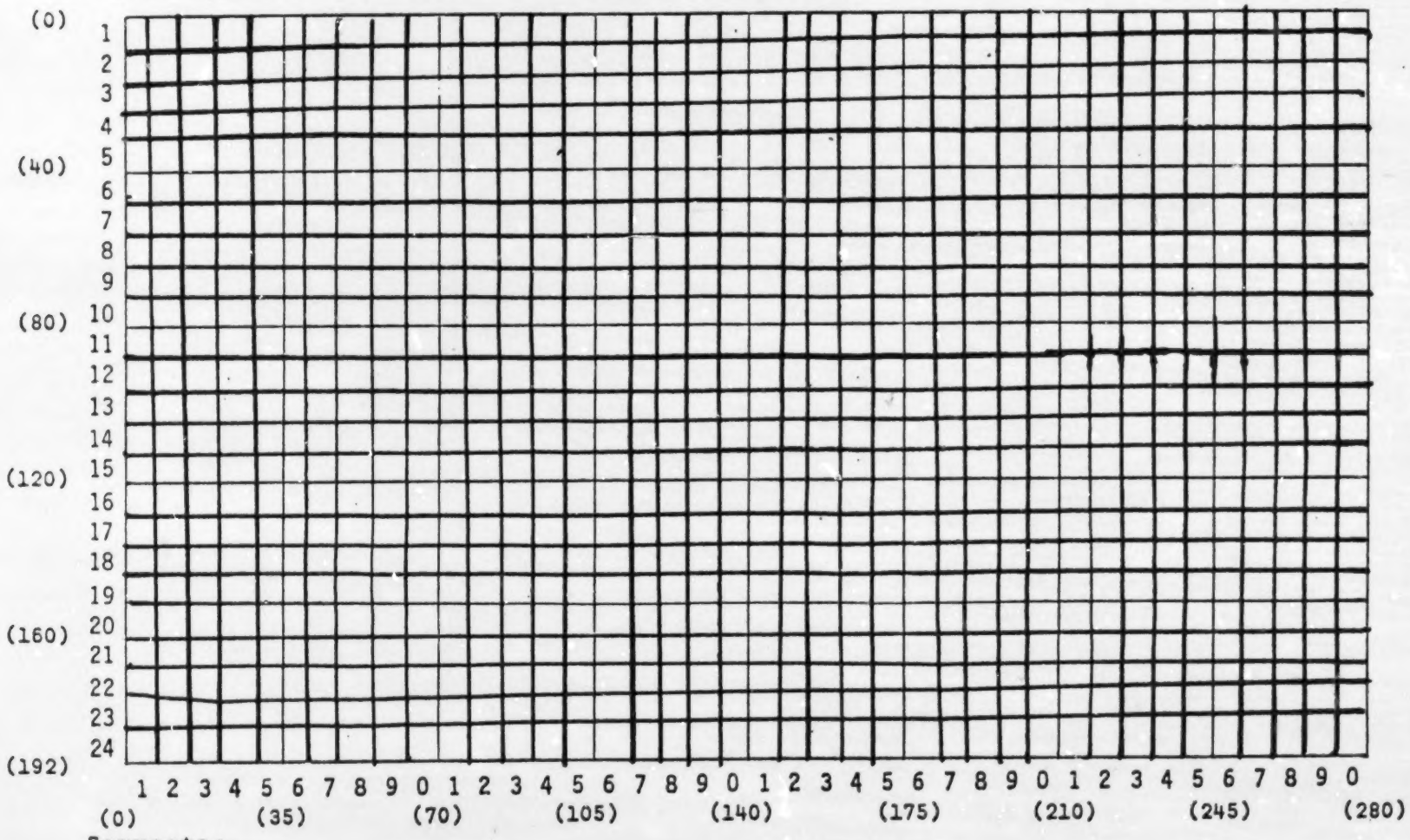
APPENDIX A

DISPLAY LAYOUT FORM

Program_____ Session_____ Frame_____



Comments:

This grid was used to represent the screen.